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CLAIMS

1. A method for forming a workpiece (24_0) of a material having an exponential tensile stress-strain behaviour into a thin-walled, hollow shell (24_3), in which:
   a) the workpiece (24_0) is clamped on the periphery and is actively rotated about its centre line (M);
   b) a freely rotatable spinning die (4) having an external side (4a) with the desired shell shape (24_3), is pressed with a suitable pressure force against a workpiece side (24a); and
   c) at least one path-controlled spinning roller (16, 17) is pressed against the other workpiece side (24b) so that the rotating workpiece (24_0) is formed into a shell (24_3) exclusively via local pressure forces, the relative velocity between the workpiece (24_0) and the at least one spinning roller (16, 17) and the force exerted on the workpiece (24_0) by the at least one spinning roller (16, 17) and the spinning die (4) being matched to one another such that tensile forces applied to the workpiece (24_0) are below the yield strength of the material of the workpiece (24_0).

2. The method as recited in claim 1,
   wherein the spinning die (4) is moved in the direction of the centre line (M) of the workpiece (24) during forming of the workpiece (24).

3. The method as recited in claim 1 or 2,

wherein the spinning die (4) is rotated at the same rotational velocity as the workpiece during the forming process.

4. The method as recited in any of the preceding claims, wherein the workpiece (24) is made of titanium, in particular of a titanium-ß alloy.

5. The method as recited in any of the preceding claims, wherein the angle of tilt of the at least one spinning roller (16, 17) is changed with respect to the peripheral direction.

6. The method as recited in any of the preceding claims, wherein the position of the at least one spinning roller (16, 17) in the direction of the centre line (M) remains essentially the same during the forming process.

7. A device for forming a workpiece (24_0) of a material having an exponential tensile stress-strain behaviour into a thin-walled, hollow shell 24_0, including:
   a) a clamping device (7, 10, 12) rotatable about a centre line (M) for clamping the periphery of the workpiece (24_0);
   b) a drive (13) for rotating the clamping device (7, 10, 12) about the centre line (M);
   c) a spinning die (4) which is freely rotatable about the centre line (M), is movable in the direction of the centre line (M), and is designed to exert a predefined pressure force against the workpiece (24_0);

d) at least one path-controlled spinning roller (16, 17) opposite the spinning die (4);

e) a first control device (40) for controlling the at least one spinning roller (16, 17) in a path-controlled manner; and

f) a second control device (50) which ensures that the relative velocity between the workpiece (24_0) and the at least one spinning roller (16, 17) and the force exerted on the workpiece (24_0) by the at least one spinning roller (16, 17) and the spinning die (4) are matched to one another such that the tension forces applied to the workpiece (24_0) are less than the yield strength of the material of the workpiece (24_0).

8. The device as recited in claim 7,
wherein the clamping device is made of a first clamping ring (7) and a second clamping ring (12) which may be tensioned with respect to one another via clamping means (11), the peripheral edge of the workpiece (24_0) being clampable between the two clamping rings (7, 12).

9. The device as recited in claim 8,
wherein one of the two clamping rings (7, 12) has external toothing with which a toothed wheel (13) driven by a drive meshes.

10. The device as recited in any of claims 7 to 9,
wherein at least one spinning roller (16, 17) is tiltable in the desired manner with respect to the peripheral direction at a specific meridian location.

11. The device as recited in claim 10, wherein the at least one spinning roller (16, 17) is tiltable via a parallelogram guide in the desired manner with respect to the peripheral direction at a specific meridian location.

12. The device as recited in any of claims 7 to 9, wherein the at least one spinning roller (16, 17) is guided via a three-axle control.

13. The device as recited in any of claims 7 to 12, wherein the first control device (40) and the second control device (50) are integrated into one common control device.

14. The device as recited in any of claims 7 to 13, wherein at least one additional spinning roller (30) having a greater diameter is available for exchange in order to form the edge areas of the workpiece.

15. The device as recited in any of claims 7 to 14, wherein a machining tool, in particular a turning tool, is used to machine the still clamped workpiece in the desired workpiece areas.

16. The device as recited in any of claims 7 to 15, wherein a cut-off tool is available for separating a finished workpiece.

17. A method for forming a workpiece blank (24_0) of a material into a thin-walled, hollow shell (24_3), in which:

a) the workpiece blank (24_0) is clamped on its periphery and is actively rotated about its centre line (M);

b) a freely rotatable spinning die (4) having an external side (4a) with the desired shell shape (24_3) is pressed with a suitable pressure force against a workpiece side (24a);

c) at least one path-controlled spinning roller (16, 17) is pressed against the other workpiece side (24b) so that the rotating workpiece (24_0) is formed into shell (24_3) exclusively by local pressure forces, the relative velocity between the workpiece (24_0) and the at least one spinning roller (16, 17) and the force exerted on the workpiece (24_0) by the at least one spinning roller (16, 17) and the spinning die (4) being matched to one another such that tension forces applied to the workpiece (24_0) are less than the yield strength of the material of the workpiece (24);

d) the workpiece blank (24_0) is heated to a processing temperature below the known hot-forming temperature for this material at least in the partial areas contacted by the spinning rollers (16, 17).

18. The method as recited in claim 17, wherein the material of the workpiece blank (24_0) is Ti 6-4.

19. The method as recited in either of claims 17 or 18, wherein the processing temperature is selected such that the state of the exponential tensile stress-

strain behaviour is achieved in the workpiece blank but no alpha case is formed.

20. The method as recited in claim 17, wherein the material of the workpiece blank (24_0) is a high-strength Al alloy, in particular Al-2219.

21. The method as recited in claim 20, wherein the material of the workpiece blank (24_0) is a high-strength Al alloy.

22. The method as recited in either of claims 20 or 21, wherein the processing temperature is selected such that a naturally aged state is achieved in the workpiece blank.

23. The method as recited in any of claims 17 to 22, wherein the spinning die (4) is heated to a temperature below the hot-forming temperature of the workpiece (24).

24. The method as recited in claim 23, wherein the temperature of the external side of the spinning die is between 50°C and 150°C , in particular 100°C .

25. The method as recited in any of claims 17 to 24, wherein the workpiece blank (24_0) is only heated to the processing temperature in the area of the spinning rollers (16, 17).

26. The method as recited in claim 19,

wherein the processing temperature is between 500°C and 650°C .

27. A device for forming a workpiece (24_0) of a material having an exponential tensile stress-strain behaviour into a thin-walled, hollow shell (24_0), including:
    a) a clamping device (7, 10, 12) rotatable about a centre line (M) for clamping the periphery of the workpiece (24_0);
    b) a drive (13) for rotating the clamping device (7, 10, 12) about the centre line (M);
    c) a spinning die (4) which is freely rotatable about the centre line (M), is movable in the direction of the centre line (M), and is designed for exerting a predefined pressure force on the workpiece (24_0);
    d) at least one path-controlled spinning roller (16, 17) opposite the spinning die (4);
    e) a first heating device (100; 101) designed for heating at least the workpiece area in which the at least one spinning roller (16, 17) contacts the workpiece (24_0);
    f) a first control device (40) for controlling the at least one spinning roller (16, 17) in a path-controlled manner; and
    g) a second control device (50) which ensures that the relative velocity between the workpiece (24_0) and the at least one spinning roller (16, 17) and the force exerted on the workpiece (24_0) by the at least one spinning roller (16, 17) and the spinning die (4) are matched to one another such that the tension forces applied to the workpiece

(24_0) are less than the yield strength of the material of the workpiece (24_0).

28. The device as recited in claim 27, wherein the spinning die is heated to a specific holding temperature via a second heating device (101).

29. The device as recited in claim 27, wherein the first heating device (100) is made of a plurality of heating devices which are able to heat separate workpiece areas to the desired processing temperature.

30. The device as recited in either of claims 28 or 29, wherein the position of the heating device (100) may be changed mechanically or manually.

31. The device as recited in any of Claims 27 to 30, wherein the first heating device and the second heating device (100, 101) are gas burners.

32. The device as recited in any of claims 27 to 30, wherein the heating devices (100, 101) are heating coils or infrared heating devices.